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The antiquity of leprosy in Britain: the skeletal evidence

Charlotte Roberts
Department of Archaeology
University of Durham
South Road
Durham DH1 3LE
England

Email: C.A.Roberts@durham.ac.uk

Abstract

Leprosy has had a long history in Britain and yet most of the evidence comprises historical documentation and iconographic evidence. The primary evidence for the disease, in skeletal remains, has been reported sporadically over the years. This paper brings together the extant data so far from published and unpublished work, considering age and sex distribution, distribution pattern and funerary context. A total of 128 individuals were affected in 41 archaeological sites from a total of 8253 burials revealing skeletons (1.55%). Most examples came from the later Medieval period, most were male, and the majority of sites revealing leprosy individuals were not leprosy hospital cemeteries. The results are discussed with reference to the limitations of the data, with suggestions for future work.

Keywords

Leprosy, Britain, frequency, Historic period, skeletal evidence

1. Introduction

'Few diseases have a richer cultural heritage, and none so rich a mythology' (Fine, 1982:1).

Leprosy is a disease with a long history whose occurrence and character today in some parts of the world indicate that, socially, it is still considered a stigmatising condition that leads to ostracism and isolation (Joseph and Rao, 1999). Of course, the stigma attached to any disease is often the result of inappropriate conceptualisation of what the disease is and how it is transmitted; leprosy is not the only disease today and in the past that has attracted stigma. The stigma associated with leprosy today (as in the past) often leads to the isolation and segregation of people from their communities and a lack of social integration with their peers, so essential for their well being. While many people working with human remains derived from archaeological sites aim to identify health problems seen in individual skeletons and in populations as a whole, often there is a lack of attention paid to the effect of disease on these people's lives. Likewise, today in hospital situations the emphasis tends to be on the disease, rather than on the person with the disease ("clinical labelling"). There is a move away from considering the character, personality and lifestyle of the person affected to looking at the clinical manifestations of the disease itself and its treatment. Leprosy provides an opportunity to look at a disease that has a complex and interesting epidemiology, that has affected people and populations from past to present, and has also had an associated stigma.

Leprosy is rarely seen in Britain today, except in immigrant populations (Van Buynder *et al.*, 1999). For example, there have been 1358 cases notified since 1951 with a peak of 467 between 1960 and 1969, then a decline. Between 1990 and 1997 40% of cases had sufficient

anaesthesia to cause functional impairment. Currently there are 128 patients on the central registry (70% male), and 71% have significant complications such as loss of vision, deformity and anaesthesia. Thus, even today in Britain, leprosy is causing misery to some people. Leprosy was apparently a common infectious disease during the later Medieval period in Britain from about the 12th century AD, although the first skeletal evidence comes from the 4th century (Reader, 1974). Most of the evidence for its prevalence comes from documentary sources (Richards, 1977), with reports in the palaeopathological literature indicating skeletal evidence for the disease. Sources suggest that the infection was feared and that people with it were diagnosed and segregated into leprosy hospitals founded mainly from the 12th to 16th centuries AD (Roberts, 1986). However, this may not necessarily have been the case for all parts of Britain at all periods of time. The skeletal evidence for leprosy has been sporadically reported over the years but until now there has been no real synthesis of data. This paper aims to bring together the extant skeletal evidence for leprosy in Britain and consider its limitations, discussing it with reference to the historical data for its presence.

2. Material and Methods

The skeletal data collated for this study comprises unpublished work by Manchester and Roberts (1986) which surveyed museum and archaeological unit curated skeletal collections, and the consideration of all published (and some unpublished) data on the skeletal evidence for leprosy (references provided in Table 1). All sites date from some time during the Romano-British period (4th century AD) to the post-Medieval periods (18th-19th centuries AD), and all populations considered are from settled communities living in permanent housing, domesticating plants and animals, and relying on

agricultural produce whether in a rural or urban environment. The diagnostic criteria taken as being indicative of leprosy followed the recommendations of Andersen and Manchester (1987, 1988, 1992), Andersen *et al.* (1992, 1994), Jopling and McDougall (1988), Møller-Christensen (1961). The following scenarios were accepted as being indicative of leprosy, and Figures 1a and b, 2 and 3 illustrate some of the cases:

1. *Facies leprosa* (or rhinomaxillary syndrome)
2. *Facies leprosa* and foot changes
3. *Facies leprosa* and hand changes
4. *Facies leprosa* with tibia, fibula and foot changes
5. Tibia, fibula and foot changes
6. Hand, tibia, fibula and foot changes

Periosteal new bone formation of the tibiae and fibulae alone were not accepted as a criterion for leprosy diagnosis because many conditions can lead to this change. For example, it may appear alone as a result of trauma, as part of one of the treponemal syndromes, or as a result of non-specific infection. Patterning of bone changes associated with leprosy is key to diagnosis as many of the changes in isolation may be the result of other pathological conditions. Diagnosis was conducted using macroscopic analysis, although biomolecular techniques of diagnosis for leprosy are developing (see this volume) and problematic cases in the future will be aided by these developments.

3. Results

The results are presented for sites that revealed evidence for leprosy (Table 1). There are many more sites from British contexts where leprosy has not been identified. Unfortunately it is not possible to determine absolute frequencies for leprosy in Britain because of problems with the data. Data produced has been presented as the percentage of individuals affected from all sites examined and, for most sites, it is not known whether all bones of all skeletons were available for study. Furthermore, it is not possible to assess exactly how many skeletons from the Romano-British period through to the late and post-Medieval periods have been studied, and therefore absolute frequencies of people affected cannot be given. This is a problem in palaeopathological study generally in the U.K., a problem that is being addressed currently.

A total burial population of 8253 skeletons from 41 archaeological sites were considered, revealing 128 affected individuals. This comprises a frequency of 1.55%. If we consider that around 50,000 burials have been analysed in Britain to date this would mean a frequency of leprosy of approximately 0.26% (individuals affected), but this must be seen only as a very general estimate; it also covers about 1500 years. Two sites were Romano-British in date (4th century AD), twelve sites were from the Anglo-Saxon period (5th-11th centuries), and 27 sites were later (12th-16th centuries) or post-Medieval (post-16th century). The sites revealing leprosy individuals derive mainly from the south and east of England with very few in Wales,

Scotland or Ireland (Figure 4). Taking the data by period, the first evidence (dated to the 4th century AD) comes from the Romano-British period from sites in Dorset and Gloucestershire (south and south-west England respectively). Two individuals are affected, comprising 0.14% of the 1480 Romano-British burials. More examples of leprosy come later in the early Medieval (or Anglo-Saxon/post-Roman) period, around the 5th-11th centuries AD. From a total of 2031 individuals, 18 (0.89%) were affected, but numbers increase in the later and post-Medieval periods (12th century to the 19th century). One hundred and eight individuals were identified with leprosy from a total of 4742 burials (2.28%). Because the majority of cemeteries of late and post-Medieval date are not stratified to the extent that it is possible to correlate specific skeletons with a more closely defined date, it was not feasible to ascertain whether leprosy fluctuated through that time period.

Thirteen sites produced multiple individuals with leprosy, which might be expected if a cemetery was attached to a leprosy hospital or even non-leprosy hospital, but for only five of the twelve sites was this the case. However, in at least one case (Timberhill, Norfolk), despite there being a large number of individuals with skeletal changes of leprosy (24 of 181 individuals), there was no such known hospital association (Anderson, 1998).

Of the 110 individuals with leprosy where a definite sex could be attributed, two thirds were male. Unfortunately for many of the sites considered, the ratio of males to females was not available, and therefore it is difficult to determine whether the sex frequency of leprosy is a true reflection of the disease's predilection for affecting males more than females. Of the 98 aged individuals with leprosy, most were in the age bracket 30-50 years, with only nine non-adults affected. Again, the age profile of many of the sites utilised for this survey was inadequate and, therefore, whether this reflects the true age predisposition is unclear.

When funerary context is considered a wide range of different types is seen. The two Romano-British cemeteries of Poundbury and Cirencester were both rural in derivation, while the twelve Anglo-Saxon contexts consisted of a churchyard cemetery (1), rural cemeteries with no associated churchyard (8), an early phase of a cathedral cemetery (1), a large pit (1) and one documented leprosy hospital. For the later and post-Medieval periods the range of contexts include, for the 27 sites, general Medieval cemeteries (4), a cist cemetery (1), cemeteries associated with abbeys (2), friaries (4), churches (3), a chapel (2), a priory (1), cathedrals (2), non-leprosy hospitals (3), leprosy hospitals (4) and a monastery (1).

4. Discussion

While absolute frequency rates for leprosy cannot be determined, results suggest that there was an increase in leprosy through time, which correlates with the historical

data. This is expected since people in the later and post-Medieval periods in particular were living in close contact with each other in mostly urban environments, where droplet transmission of leprosy would have been possible. The number of cases, however, is low. Perhaps this supports suggestions by MacArthur (1953:18) that there were few leprosy individuals in Britain during the Medieval period, and (1925) that the term probably represented many conditions which were interpreted incorrectly. Most cases come from the south and east of England with few in the north and west, although the late and post-Medieval cases tend to be situated further north into northern England and Scotland (Figure 4). However, we know from historical data that the last indigenous case of leprosy in the British Isles was admitted to Edinburgh Hospital in Scotland in 1798 from the Shetland Islands (Browne, 1975), and that leprosy hospitals founded in the 15th and 16th centuries tended to be further north into Scotland (Roberts, 1986). The lack of evidence in Wales, Scotland and Ireland may be explained in part because of the acidic soils in those areas which does not preserve bone well. Furthermore, many cemetery sites will probably lie unexcavated in the rural areas of these places where new building development is not as much of a threat to archaeological evidence; perhaps the concentration of sites revealing leprosy individuals in the south and east reflect the amount of archaeological fieldwork undertaken. However, even more relevant is that many skeletons from archaeological sites lack hand, foot and facial bones for examination, and it is unclear how many of the individuals in this study suffered postmortem loss of bone. Although the 200 plus leprosy hospital foundations from the 11th to the 16th centuries AD in Britain cannot be taken as indicative of the frequency of the disease, their distribution matches the skeletal evidence (Figure 5). This may suggest population density at the time or that people were more charitable during those time periods. However, it is suggested that these hospitals were opened also for the non-leprosy, and certainly in the later periods of their use they became general hospitals when leprosy declined from about the 14th century onwards.

In many clinical studies males are reported to be more affected than females (e.g. Van Buynder *et al.*, 1999) but there may be many reasons for this pattern. For example, in some parts of the world females do not have the privileges of social freedom that many western countries have and, therefore, may not have access to diagnosis. Women often have to stay at home for domestic responsibilities and, furthermore, they may not be comfortable in exposing their bodies to male physicians for diagnosis of early skin lesions. It may also be possible that females could have a stronger immune response to leprosy than males; Ortnier (1998) suggests that females may, in fact, possess this attribute. However, if females were stronger in this sense then we may expect to see more extensive bone damage on female skeletons rather than males (see Wood *et al.*, 1992), or alternatively they may be less likely to show bone change even though they had the disease. Interestingly, a recent study suggests that women

in India with leprosy actually have a better quality of life than men. This perhaps reflects their acceptance of the disease because of their secondary role in society (Joseph and Rao, 1999). However, the effect on males, e.g. the ability to maintain employment, may be more devastating.

With respect to age and leprosy, although a correlation was made, it should be remembered that a person with leprosy bone change could have developed that change any number of years before their death; thus, is age relevant in the discussion? Leprosy can also have a very long incubation period and this will affect when bone changes develop, so that people need to survive well into adulthood to develop bone changes (for example, skeletons of children with rhinomaxillary syndrome from Naestved, Denmark showed few postcranial changes, Mary Lewis, pers. comm.). The many extrinsic and intrinsic factors that affect whether infection develops or not in a person further complicates the picture.

The funerary contexts from which the leprosy individuals in this study derive clearly cover a wide range and are not all from leprosy hospital cemeteries which might be expected if the historical data for diagnosis and segregation is to be believed. However, only five leprosy hospitals were identified from a total of 38 sites considered. This raises a number of questions and comments. If leprosy was a stigmatised disease and people were ostracised in the later Medieval period, then why do we find most of the leprosy individuals in British contexts in non-leprosy funerary situations? Some suggestions can be made: the person with leprosy may have been accepted within their social group despite being diagnosed as leprosy. The generic statement that the leprosy in the later Medieval period were segregated may not hold true. Perhaps diagnosis was not accurate? Simpson (1842) indicates that this may have been the case, and it is suggested that diagnostic methods were often unconventional. Although some diagnosticians may have known how to diagnose leprosy, others may not have had the necessary knowledge. Finally, the person may not have, externally, appeared leprosy and, therefore, may not have been diagnosed or segregated. Furthermore, if a person had a low resistant form of the disease, the manifestation of leprosy in their bodies may not have been particularly obvious. It may have been only those with lepromatous leprosy who were diagnosed, while those with less severe forms were left to function relatively normally within their social group. Nevertheless, people could have evaded detection, knowing that their lives would be over once they entered a leprosy hospital, or they could have made themselves look leprosy to gain charity. It therefore cannot be predicted exactly where leprosy individuals lived, died and were buried in Britain because of many confounding factors.

Clearly, the frequency of leprosy, as seen in skeletal material from archaeological sites in Britain, cannot be taken as the absolute frequency of this disease during the Historic period for a variety of reasons. The sites considered here are only those which have revealed

leprosy and, therefore, the "individual" frequency refers only to the total number of individuals for all the sites examined. Many more cemetery sites have been excavated and examined but no evidence of leprosy has been found. Thus, the skeletal material considered here is only a small sample of the original living population and is therefore biased (see Waldron, 1994 for more discussion on sample representivity). Consequently, age and sex distribution will also be biased, and therefore any comments on the demographic profile of the leprosy individuals identified must subsequently be flawed. Furthermore, leprosy is known to affect the skeleton in up to only 15% of people (Steinbock, 1976:198). Therefore, only the very tip of the iceberg of the leprosy problem in Britain is being seen in the skeletal evidence. Nevertheless, higher frequencies may be expected in leprosy hospital cemeteries; for example, 77% of 202 individuals in the Medieval leprosy hospital at Naestved, Denmark had bone change (Andersen, 1969) which is equivalent to modern leprosy hospital rates.

There will also inevitably have been loss or damage to facial, hand and foot bones for many skeletons from these sites and, therefore, true frequencies for leprosy bone change cannot be suggested. Nevertheless, the rate of leprosy involvement of the skeleton is low in untreated leprosy today, and therefore a low percentage frequency rate may be expected. Furthermore, whether a person develops bone change will depend on their immune status, age at contraction and the length of the incubation period. There are, in addition, a number of social and environmental factors that are necessary for leprosy to be contracted. For example, a well balanced nutritious diet will help build a strong immune system and prevent a person being infected, and crowded living conditions will help leprosy to be transmitted. A question that has not yet been answered is whether those individuals buried in leprosy hospital cemeteries with no bone damage actually had leprosy. For example, only 36 of the 351 individuals from the Chichester leprosy hospital have bone change accepted as indicative of leprosy (Ortner, pers. comm.), although around 70% of the skeletons from the Naestved leprosy hospital cemetery (Danish) had leprosy bone change. Biomolecular techniques and analysis should help in the future and could provide absolute frequency rates.

The data presented here tells us something about leprosy in Britain but the data are biased in a number of ways. There is much more work that needs to be done in Britain in order to ascertain the real frequency of leprosy. This is a pre-requisite for comparative work in Europe and to be able to comment on how data from Britain fits in with the overall origin, evolution and palaeoepidemiology of leprosy throughout the world. Future meticulous and careful excavation, recording and analysis should provide the data needed to contribute to a world history of leprosy.

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Table 1 Sites revealing leprous skeletons

Site	Numbers Affected	Male	Female	Unsexed adult	Juvenile	Reference
Romano-British						
Cirencester Gloucestershire	1		1			Manchester and Roberts 1986
Poundbury, Dorset	1	1				Reader, 1974
Post-Roman/ Anglo-Saxon						
Beckford, Hereford and Worcester	1	1				Wells, 1962
Bedhampton, Hampshire	1		1			Manchester and Roberts, 1986
Burwell, Cambridgeshire	1	1				Møller-Christensen and Hughes, 1962
Cannington, Somerset	3	1	2			Brothwell <i>et al.</i> , 2000
Eccles, Kent	1	1				Manchester, 1981
Edix Hill, Barrington, Cambridgeshire	1		1			Duhig, 1998
Raunds, Northamptonshire	3	3				Powell, 1996; Manchester and Roberts, 1986
School Street, Ipswich, Suffolk	1		1			Mays, 1989
Staunch Meadow, Brandon, Suffolk	1	1				Anderson, 1990
St Catherine's, Norfolk	1			1		Wells, 1967
Tean, Isles of Scilly	1			1		Møller-Christensen and Hughes, 1962
Broughton Lodge, Willoughby-on-the-Wolds, Nottinghamshire	1	1				Roberts, 1993
York Minster, York, Yorkshire	2		2			Manchester and Roberts, 1986

Later and Post-Medieval						
Carmelite Friary, Aberdeen, Aberdeenshire	1	1				Stones 1989, Cardy 1989
Abingdon, Oxfordshire	1	1				Hacking and Wakely, n.d.
Blackfriars, Gloucester, Gloucestershire	2		2			Wiggins <i>et al.</i> , 1993
Blackfriars, Suffolk	4	3	1			Mays, 1991
Castle Hill, Scarborough, Yorkshire	1	1				Brothwell, 1958
Chichester, Sussex	36	28	7	1		Knusel and Goggel, 1993, Lee and Magilton, 1989, Magilton and lee, 1989, Ortner pers. comm., Ortner <i>et al.</i> , 1991
Exeter, Devon	2	1	1			Manchester and Roberts, 1986
Glasgow Cathedral, Glasgow, Scotland	1	1				King, 1994
Grantham, Lincolnshire	3	2	1			Boulter, 1992
Greyfriars, Chester, Cheshire	1		1			Manchester and Roberts, 1986
Guildford Friary, Surrey	1	1				Manchester and Roberts, 1986
Hallow Hill, St Andrew's, Fife Scotland	1		1			Lunt, 1996
Ilford, Essex	4	2	2			Manchester and Roberts, 1986
Kirk Hill, St Andrew's, Fife Scotland	1			1		Lunt, 1997
Newark Bay, Deerness, Orkney, Scotland	1	1				Taylor <i>et al.</i> , 2000, Brothwell, 1977, Brothwell and Krzanowski, 1977
Nonesuch Palace, Ewell, Surrey	1	1				Møller-Christensen and Hughes, 1962
Norton Priory, Cheshire	1	1				Manchester and Roberts, 1986
South Acre, Norfolk	5	1	4			Wells, 1967
Stonar, Kent	3		2	1		Manchester and Roberts, 1986
St Giles, Edinburgh, Scotland	1		1			Manchester and Roberts, 1986
St Giles, North Yorkshire	3	2	1			Chundun and Roberts, 1995
St John, Timberhill, Norfolk	28	7	11	1	9	Anderson, 1998
St Leonard's, Nottinghamshire	1		1			Bishop, 1983
St Margaret's, High Wycombe, Buckinghamshire	2		1	1		Farley and Manchester, 1989
St Patrick's, Armoy, County Antrim, Ireland	1			1		Murphy and Manchester, 1998
Stratford Langthorne Abbey, Essex	1	1				Manchester and Roberts, 1986
Whithorn, Scotland	1		1			Cardy, 1997



Figure 1(a) Superior view of nasal surface of palate from an individual from the later Medieval site of Norton Priory, Cheshire; pitting and new bone formation with loss of anterior nasal spine



Figure 1(b) Lateral view of 1(a) showing loss of anterior nasal spine



Figure 2. Lateral view of Anglo-Saxon individual from Bedhampton, Hampshire, showing loss of anterior nasal spine

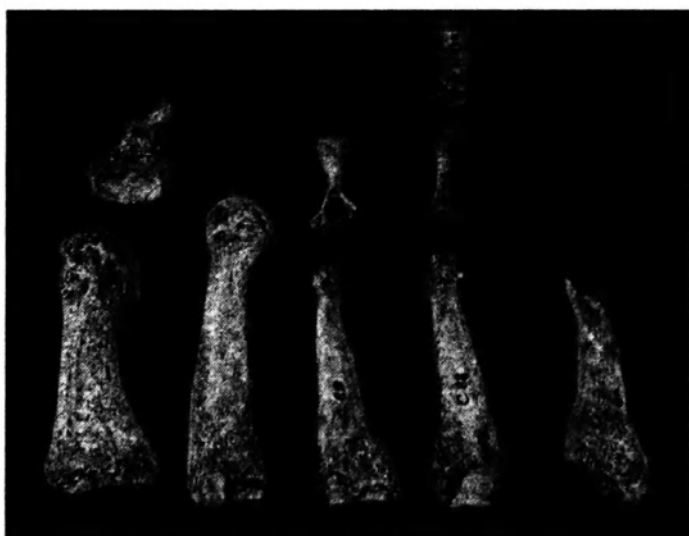


Figure 3. Right metatarsals and some phalanges from an individual from the later Medieval leprosy hospital cemetery of Chichester, Sussex showing resorption and pencil-like thinning of the distal metatarsals, and concentric atrophy of proximal phalanges with joint surface destruction



Figure 4. Distribution map of leprosy individuals from Britain



Figure 5. Distribution map of leprosy hospitals founded between the 11th and 16th centuries AD in Britain

